

Is institutional education economically overrated?

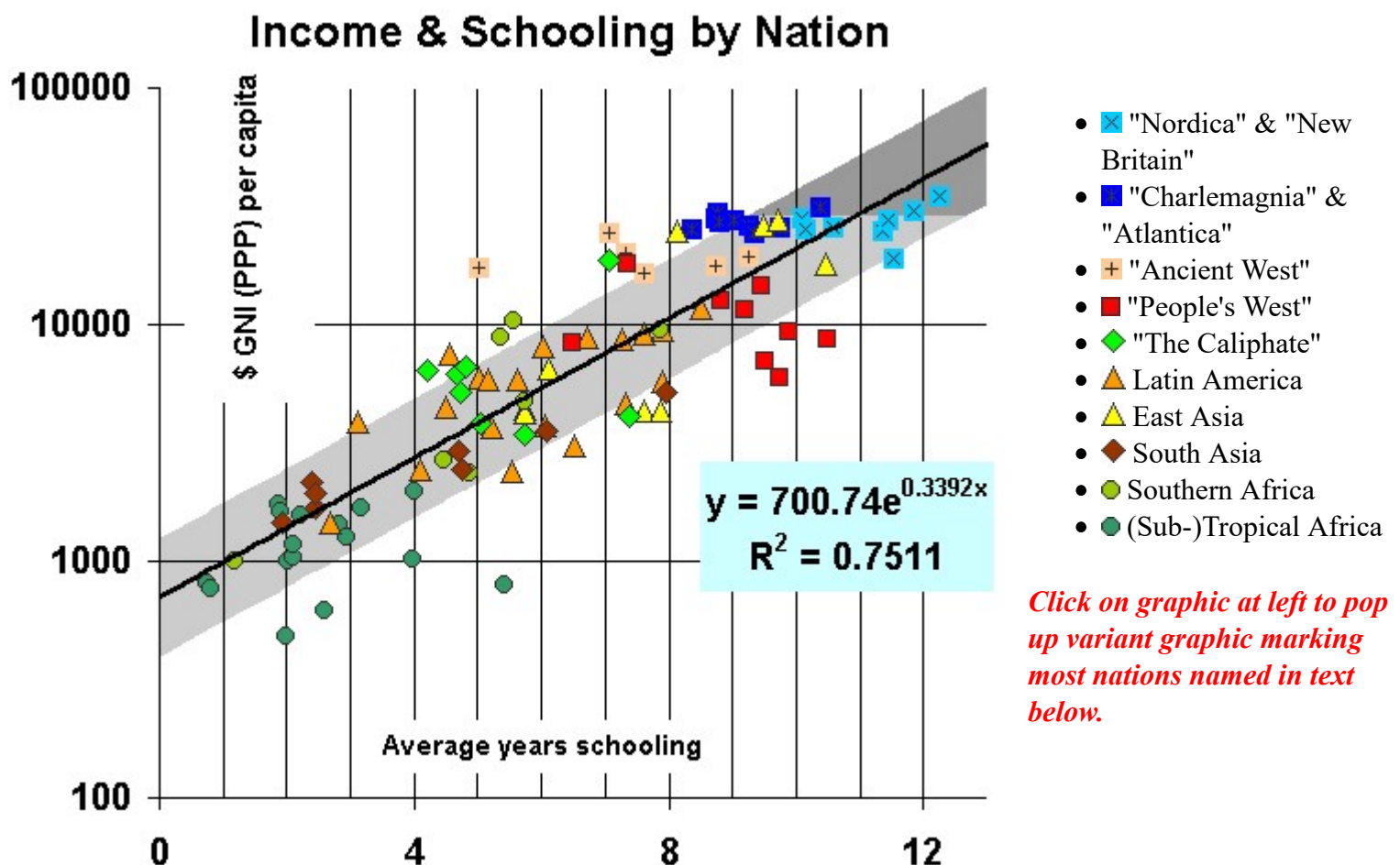
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...We do not even have a clear idea of what education is supposed to accomplish. As an example, what are parents who send their child to Harvard paying for? Is it the excellence of the Harvard faculty? The stimulating atmosphere of living and studying with other students with top credentials? A chance to mature away from home? Access to the libraries and museums at Harvard? The Boston social scene? The chance for their child to network with future movers and shakers? The opportunity to boast to their coworkers and neighbors of their prowess in raising children? Probably a combination of all. Education is supposed to prepare an individual for life, but we do not have a clear model of how it does that. With rapid change, we do not even know what life to prepare for...

- [Prof. Andrew Odlyzko](#), University of Minnesota

"Education" - guided learning - might serve any or all of many purposes within a society: communicating and reinforcing social norms and institutions, transmitting religious or other ideological orthodoxies, legitimating existing power structures, requiring a desire for an understanding of the world through the study of human history and natural science - or other ends not mentioned here. But when one looks to education to solve the problems of economically poor nations, or poor communities, families or persons within a nation, it is obvious one is focused on the potential for education to improve productivity: to make the material and psychological things people need and/or desire (which they create and trade) more bounteous, or at least available for less effort or grief. Examination of this economic end of education is the subject of this essay.

Raw association of schooling and prosperity



The graphic above plots data for 100 nations. The [2001 income data](#) used comes from the World

Development Indicators database, World Bank, August 2002. The [2000 average years schooling \(age 25+\) data](#) used comes from the study [International Data on Educational Attainment: Updates and Implications](#), Robert J. Barro and Jong-Wha Lee, CID Working Paper No. 42, April 2000. The data needed to generate the graphic are stored in [this](#) spreadsheet.

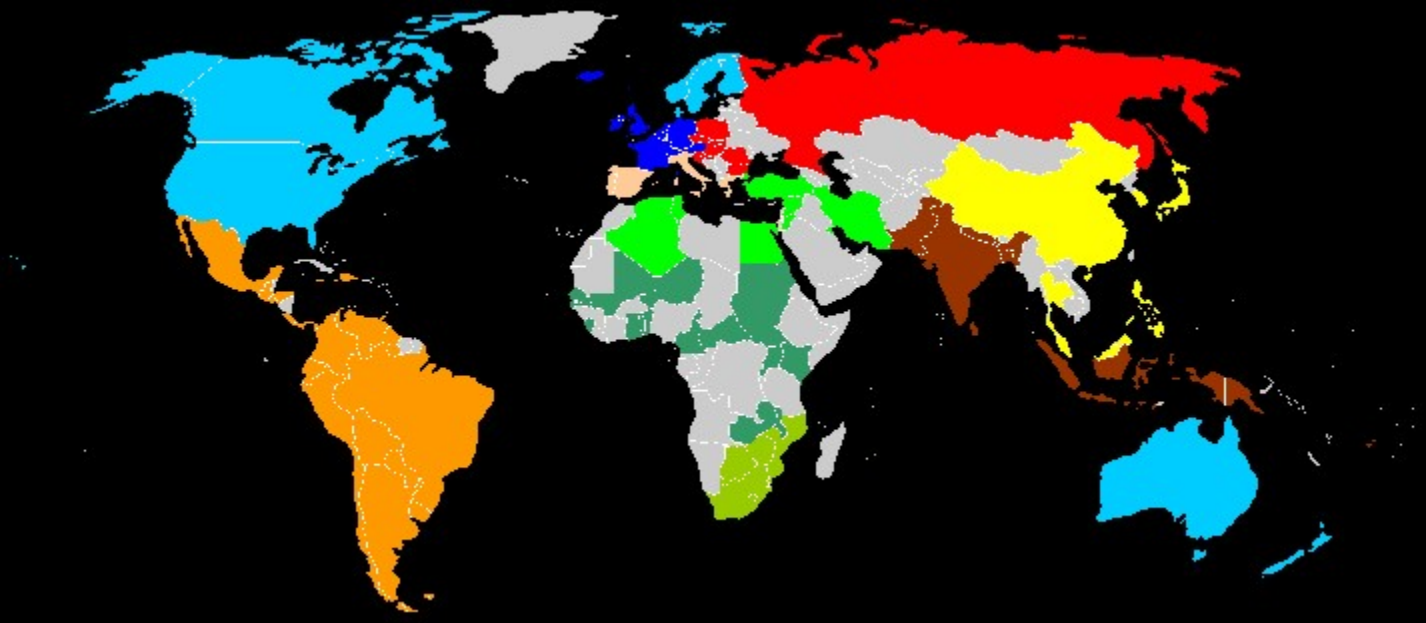
The grey band shows the breadth of the standard error to the linear fit. Edge-to-edge, it is an income factor just over 3. Almost no nation pushes into the dark grey section, even with considerable additional schooling.

The national-group color-coding scheme used in the graphic is documented in a global map a few paragraphs below.

The economic literature on the relationship between education and growth is ambiguous, if not conflicted. The very strong linear correlation between average years of schooling and the (logarithm of) the average income illustrated above does not necessarily prove causality flows one way or the other.

But what if one *stipulated* that more schooling is an independent deterministic *cause* (among others) of higher income? How might one then characterize the data above? The trend line says that without any schooling, average income is \$701 (PPP) per year - just shy of two dollars per day. Income improves *exponentially* with more education at the astounding rate of almost **two mils per day** of extra schooling! (Assuming 180-day school "years".) At this rate of 34% per annum, continuously compounded, income doubles for barely more than two extra years education, and is multiplied more than 58-fold with twelve years of education. What a phenomenal hypothetical "return on investment"!

Of course, if one alternately stipulates that schooling is a *consumption* good, one instead says that the *appetite* for education grows logarithmically with income.



The terms we use for the various groupings should not be taken too literally: Indonesia might be grouped with East Asia, but we group it within South Asia instead. Slovenia and Croatia are in "People's West", but were also a part of Charlesmagne's lands. And while Jamaica speaks English, it is grouped within Latin America. And so on.

-  "Nordica" & "New Britain"
-  "Charlemagnia" & "Atlantica"
-  "Ancient West"
-  "People's West"
-  "The Caliphate"
-  Latin America
-  East Asia
-  South Asia
-  Southern Africa
-  (Sub-)Tropical Africa

We might use our graphics to explore what correlations exist between average income, average education and the many factors which might influence those: climate, other geography, language, culture and religion, ethnicity and history, among others. These considerations influenced our choice of national groups.

European nations and their intensive New World offshoots (marked with squares) tend to be high in both income and education level within the global panorama, but they show remarkable variation in schooling level all the same.

The "Nordica" & "New Britain" sub-group has the highest education level. Despite some schooling variation within the sub-group, there is no important association with income. The sub-group we call "Charlemagnia" & "Atlantica" repeats this story, just at a mean sub-group schooling level a couple years lower, with the same mean sub-group income.

The "Ancient West" group has even lower schooling levels, but only small variation in income within the group and only modestly less income than the previous two better-educated subgroups.

Perhaps the most striking thing about these three-subgroups is how *little* mean schooling level associates with income! An especially stunning illustration of this focuses on Portugal, with only 4.9 years of schooling on average. Compared to New Zealand, with 11.5 years of schooling, it lags only about 15% in PPP income all the same! In fact, Portugal has even less average schooling than a nation in tropical Africa, Zambia (5.4 years), but over 20 times the average income of Zambia all the same. Obviously, sometimes the amount of schooling a country possesses has little impact on whether it is wealthy or poor, compared to some other determinative influences!

We have segregated nations previously exercising militant state socialism into a European/offshoot subgroup anachronistically called the "People's West". These ex-Communist nations have schooling levels comparable to the aggregate of the three previous European sub-groups, but incomes significantly smaller. If one hypothesizes that schooling is an investment good, not a consumption good, an interesting result obtains for this sub-group. Roughly speaking, the geographically closer such a nation is to one of the never-Communist European nations (even Austria, which had a huge state socialist sector) the better it now performs for a given amount of education. (This proximity advantage might also explain the high income in Portugal - laminated against Spain - in the face of limited education.) Alpine Slovenia is especially noteworthy in this regard, butted up to Italy and Austria. It also should be noted that Yugoslav Communism practiced inter-plant competition unknown in a place like the Soviet Union, whose successor the Russian Federation is a complementary example to Slovenia in this sub-group.

Having exhausted the polar and temperate zone (European/offshoot) Caucasians, we can now examine the two (sub-)equatorial Caucasian groups, indicated with rotated squares or "diamonds".

Mahgreb and Near East Muslim nations, which we call "The Caliphate," are spread around the center of the chart. A significant outlier is oil-rich Kuwait, whose geological patrimony provides a rationale for its high income, about that of Slovenia and Spain. In contrast, Jordan, with more education than Kuwait, is significantly poorer.

The remaining sub-group, South Asia, spreads around the lower-left center of the chart. It includes many Dravidian people as well as Caucasians. There is positive correlation between education and income, but weaker than the global trend-line.

Latin America, the mestizo child of Iberia, is shown with orange triangles. This vast area includes substantial ethnic contributions from the indigenous "Indians", as well as from tropical Africa. The heaviest influence of Europe (including significant non-Iberian components) is in the temperate south, which includes most (but not all) of the sub-group's wealthiest lands. Latin America sprawls along the center of the chart, showing the greatest variation of any national grouping we have elected to compose. The grouping straddles the global trend line very symmetrically, along much of its length. There is also little clumping within this span, with a continuous sprinkling of nations throughout. The wealthy and highly schooled Argentina sits on the upper right border of the grouping, while its economic and education opposite, French-speaking, African-dominated Haiti, squats on the lower-left border.

Also indicated by triangles (yellow ones) is the East Asia group. It is made up of two distinct clumps of nations. The mature "tigers": Japan, South Korea, Singapore and Hong Kong (no Taiwan data is presented) are comparable in education and income to the three non-ex-Communist European subgroups. It's interesting that each mature tiger is either an island/archipelago, or, in one case, a peninsula tip cordoned off from the Asian mainland by an "Iron Curtain." Among these countries, there is no positive correlation between schooling and income. The other East Asia clump sits in the middle of the chart, with dramatically less income and education, the least in both parameters being China. Population giant China, like giants India and Indonesia in the South Asia grouping, sits just a bit below the global trend line.

The remaining two groupings are in Africa and are shown with circles. Taken together, these two groupings show even more variation than we saw in Latin America. But the dramatic differences of the two, correlated with their respective mean polar distances, makes it revealing to keep them apart.

Southern Africa basically spans a similar range that mid- and high-ed/income Latin America does. The substantially well-off republic called South Africa sits right on the trend line, at the same spot as Chile. Indian Ocean-situated Mauritius and diamond-rich Botswana show average incomes comparable to South Africa - but with considerably less mean schooling.

The remaining national grouping, (Sub-)Tropical Africa, is the saddest. Its income range is even worse than the poorest South Asian nations. There is no clear correlation between with what little education is enjoyed and economic performance. As we noted, Zambia can provide more schooling on average than Portugal, but is among the very poorest of nations even as Portugal is among the very wealthiest of them. Perhaps issues other than limited schooling, like infectious disease and the political violence which is easily ignited when people teeter near the edge of life-threatening poverty, should occupy the minds of people interested in helping these lands.

Summary

There is a strong linear relationship between the (logarithm of) average income and the average years of schooling among the 100 nations examined, explaining three-quarters of the variance in income. (It is remarkable that *averages* of income and schooling within each nation - rather than more complete information about intra-national *distributions* - is adequate to obtain so predictive an international relationship between income and schooling; more on this in the postscript below.)

In general, we see that virtually no highly wealthy or educated nations are found near the equator, a stunning counterexample being Singapore. (One might better call the so-called "North-South" Divide the "Temperate-Tropical" Divide, because nations like South Africa, Argentina and Australia sit in the southern hemisphere's temperate zone.)

The importance of a temperate climate and water transport - either in nucleating prosperity in the past and/or sustaining it today - was witnessed by the following empirical observation by economist Jeffrey Sachs in 2001, when he was Director of Harvard's Center for International Development, who [wrote](#):

When I used some GIS [Geographic Information System -RF] data recently to look at the temperate zone coastal regions that are within 100 kilometres of a navigable waterway or the ocean, it turns out that those thin strips of land... are about 8 percent of the inhabited landmass of the world. But at least 52 per cent of the world's GNP is produced in those thin strips... If you look at the landlocked countries in the world... you will find no success stories, except if you happen to be landlocked surrounded by rich countries...

Cheaply extractable geological gifts like diamonds (Botswana) or oil (Kuwait) may be the reason a nation enjoys an income much larger than the global income-education trend-line would predict. Sharing a common language (Spanish outside of Brazil, Jamaica and Haiti) and similar historical roots does not necessarily predict comparable levels of income and education among a group of nations (Latin America).

European and offshoot nations which were never Communist are all now among the very wealthiest, despite an enormous range in mean years of schooling. (We omit highly mestizo Latin America from this statement.) But a rule almost without exception is they each have an average of at least seven years of schooling (primary education), and one of them (the US) exceeds twelve years. This sort of success is restricted neither to cultures with Christian origins, nor to those preponderant in light-skinned Caucasians, as conceits in bygone days might have noted: East Asia includes multiple nations with similar schooling and income. And for that matter, the 1.7 million ethnic (Asian) Indians in the United States today have the highest average income among all large US ethnic groups: [Their income is 54% higher than the national average, and 1 in 9 is a millionaire.](#)

The nations of (Sub-)Tropical Africa shown have a non-negligible spread of incomes, but all are very poor. Among them, there seems to be basically no significant correlation between education and income.

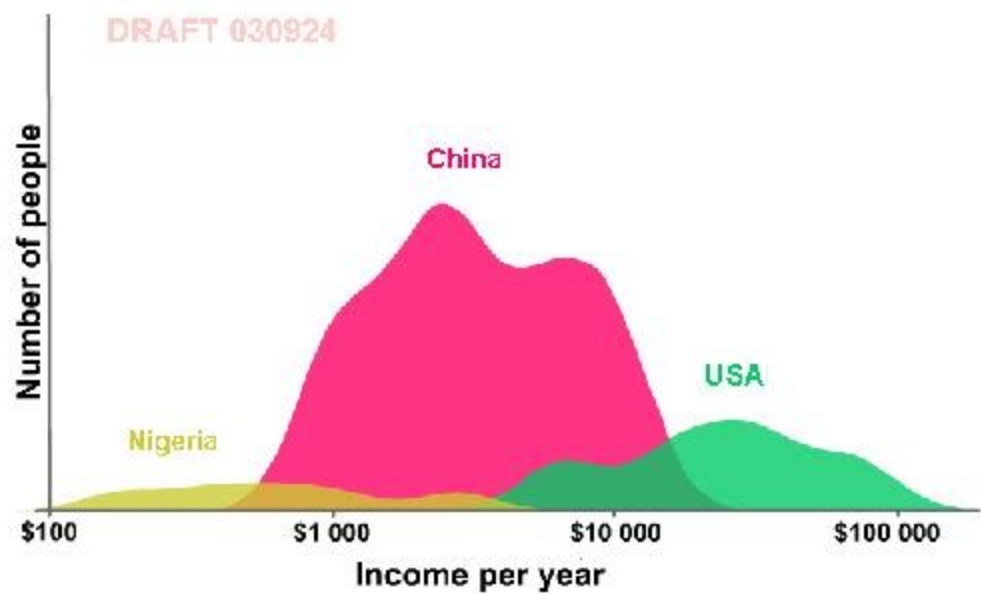
The graphic conveys no information about temporal evolution. It should be remembered that a mere half a century ago, high-income and high-schooling South Korea had very little of either. And it is well-known that China is now following an exemplary "tiger" trajectory. The average income and schooling of a nation is hardly always a permanent prisoner of something as unyielding as ethnicity and geography. This was something for which we had an example (Japan) over a century ago.

Postscript: Averages are not distributions

It's worth reminding ourselves that the average per capita income of a nation doesn't say all there is to know about its economy. The same is true for average years of education per capita. Distributions might be critical for building a *causal* model (versus a mere *statistical* one) which captures the relationship between income and schooling.

In fact, not only do incomes vary tremendously between various countries, they also vary non-trivially within them as well. Below, using data attributed to [Sala-i-Martin](#), and a graphical rendering courtesy of a [G A P M I N D E R](#) project applet, we show the PPP-corrected 2000 income distributions within Nigeria, a low-income nation, China, a middle-income nation, and the United States, a high-income nation. It is obvious that the simple dichotomy "developing/developed" nation obscures the great differences between various nations, and may let us forget that various regions of a "developing" country may show remarkably different amounts of progress - especially in large nations. (As far as I know, international studies have not applied any PPP-style (USA: COLA) corrections *within* nations.)

Income distribution 2000



nation (year)	poorest 10% share (percent)	poorest 20% share (percent)	richest 20% share (percent)	richest 10% share (percent)	richest 10% to poorest 10%	richest 20% to poorest 20%	Gini index
Nigeria (1996-7)	1.6	4.4	55.7	40.8	24.9x	12.8x	50.6
China (2001)	1.8	4.7	50.0	33.1	18.4x	10.7x	44.7
USA (2000)	1.9	5.4	45.8	29.9	15.9x	8.4x	40.8

Useful, if incomplete, information about income distributions are often used for simplicity in modeling and making comparisons. One such metric is the [Gini index](#), in which 0 indicates perfect equality, and 100 indicates perfect inequality. The values for the three countries shown above come from the [2004 UN Human Development Report](#).

Schooling versus literacy

A more subtle question than measuring the number of years in school is the matter of distinguishing schooling and intellectual development. Is submission to a special institutional cultural regimen necessary or at least superior for development of the human mind, especially in a way which enhances the ability to be economically productive?

While it is clear that certain disciplinary knowledge mastered in high school or college - like a foreign language or chemistry - may be relevant for certain occupations, are there knowledge-independent skills developed in graduating from these institutions (or studying outside of them) which are of value for a broad range of careers and other important activities of adult life? And can such skills be developed in other ways?

In recent years, a new metric, the International Adult Literacy Survey, (IALS) has emerged to quantify a more sophisticated definition of literacy and then measure this amongst various subgroups in a large subset of the (wealthy) OECD nations, as explained in the following breakout box.

[Literacy in the Information Age Final Report of the International Adult Literacy Survey](#)
(2000, 205 pages) proudly boasts:

The data presented in this publication, drawn from 20 countries... provide the world's first reliable and comparable estimates of the levels and distributions of literacy skills in the adult population.

A brief [digest](#) of the report says this:

Many previous studies have treated literacy as a condition that adults either have or do not have. The IALS no longer defines literacy in terms of an arbitrary standard of reading performance, distinguishing the few who completely fail the test (the "illiterates") from nearly all those growing up in OECD countries who reach a minimum threshold (those who are "literate"). Rather, proficiency levels along a continuum denote how well adults use information to function in society and the economy...

Another [document](#) elaborates so:

Literacy is defined as the ability to understand and employ printed information in daily activities, at home, at work and in the community - to achieve one's goals, and to develop one's knowledge and potential. In order to measure proficiency levels in the processing of information, IALS examined three literacy domains: prose, document and quantitative...

Prose literacy: the knowledge and skills needed to understand and use information from texts including editorials, news stories, poems and fiction.

Document literacy: the knowledge and skills required to locate and use information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables and charts.

Quantitative literacy: the knowledge and skills required to apply arithmetic operations, either alone or sequentially, to numbers embedded in printed materials, such as balancing a chequebook, figuring out a tip, completing an order form or determining the amount of interest on a loan from an advertisement...

For each domain, literacy proficiency was measured on a scale ranging from 0 to 500. The scale was then divided into five broad literacy levels...

Level 1 indicates persons with very poor skills, where the individual may, for example, be unable to determine the correct amount of medicine to give a child from information printed on the package.

Level 2 respondents can deal only with material that is simple, clearly laid out, and in which the tasks involved are not too complex. It denotes a weak level of skill, but more hidden than Level 1. It identifies people who can read, but test poorly. They may have developed coping skills to manage everyday literacy demands, but their low level of proficiency makes it difficult for them to face novel demands, such as learning new job skills.

Level 3 is considered a suitable minimum for coping with demands of everyday life and work in a complex, advanced society. It denotes roughly the skill level required for successful secondary school completion and college entry. Like higher levels, it requires the ability to integrate several sources of information and solve more complex problems.

Levels 4 and 5 describe respondents who demonstrate command of higher-order information processing skills.

This essay will not critically examine the claims and standards of the IALS, but instead uncritically stipulate they are true and examine the consequences.

A minimum of 6 percent of adults have advanced literacy levels (4 or 5) in the high GDP per capita nations examined by the study.

For all three IALS literacy components - prose, document and quantitative - US college graduates are very close to graduates in Sweden - but *only* if you mean Swedish *high school* graduates. (cf. Figure 2.4) Why do Americans have to expend four or more extra years of their life (not to mention the financial costs in both tuition and lost earning years) to come up to the standards high school students in Sweden achieve?

However, American college honors are slightly redeemed by the literacy of Polish college grads - their averages are comparable to those of high school *dropouts* in Germany.

When one measures document literacy, in both Sweden and Germany, the majority of high school dropouts still show acceptable levels (3, 4, or 5) for functioning well in a modern society. (cf. Figure 2.5) But the United States is a vastly different story: only one in six high school dropouts achieve acceptable levels.

From what I've read in partially digesting this report, the mystery of why formal schooling is more or less useful in raising literacy in various nations is not uncovered. Among the wealthy nations, the average level of literacy separating high-school dropouts and college grads is small among Germans, and large among Americans. It would seem that Germans go to college largely to gain *knowledge*, while Americans also (or [primarily?](#)) go to fully develop their literacy. Inequality of prose literacy between the extreme deciles was found to be a useful linear predictor of inequality in income, as measured by the Gini coefficient. (cf. Figure 4.13).

Perhaps these facts help explain why many European nations exhibit far fewer average years of schooling than the United States, but match, or even exceed, the [labor productivity](#) of the United States: Europeans develop as much literacy without attending as much school as Americans.

The very large number of Americans who complete college pull significantly ahead in literacy compared to those who only reach lower education rungs. In Western Europe, far fewer attend college, and those who do don't seem to boost their literacy as far above those reaching lower education rungs, compared to the United States. If you stipulate literacy is a useful predictor of earning ability, it is clear these facts then anticipate the higher income inequality seen in the United States than in Western Europe.

In Richard Florida's book [The Flight of the Creative Class](#), the author attacks nominal academic credentials, and then goes on to emphasize the critical advantage of the ability to *learn*. He writes:

Recently, a team of Canadian economists made a significant breakthrough... The... team found that if you measure actual skills... rather than simply educational qualifications or degree, you get a much more powerful explanation for economic growth...

*Working with Statistics Canada, the research team came to two important conclusions. First, indicators that reflect a **POPULATION'S LITERACY DO MUCH BETTER IN PREDICTING ECONOMIC GROWTH THAN MEASURES BASED ON YEARS-IN-SCHOOL**... [Second, literacy has] a positive and significant connection to long-term economic well-being. The Canadian economists note that a 1 percent rise in literacy scores (relative to the international average) is associated with an eventual 2.5 percent rise in labor productivity and a 1.5 percent rise in per capita GDP (both also relative to the international average.)"*

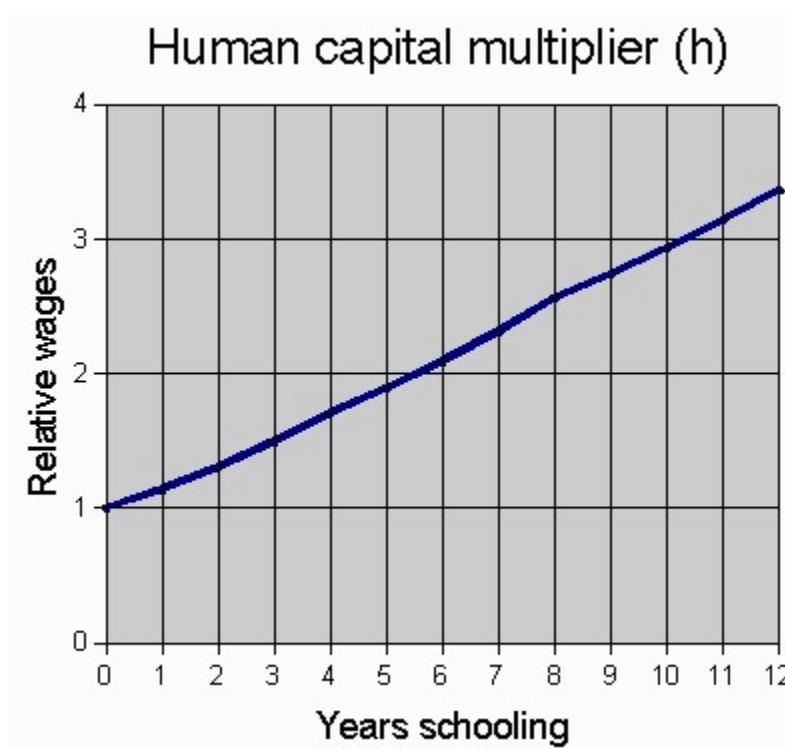
The IALS has not been administered in any developing nations. Moreover, its relevance is not manifest for nations which are not (yet) what it calls a "complex, advanced society", whose economies instead largely exhibit traditional pre-"Information Age" architectures.

Conventional wisdom - and confusion

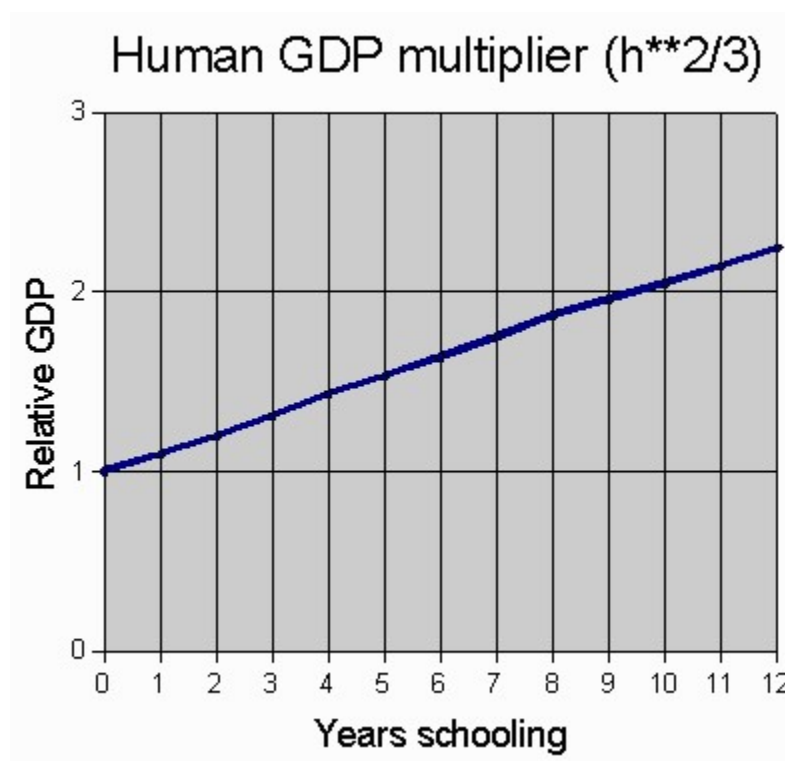
The relationship between education and economic performance has received not a little attention from [econometric](#) studies. The forthcoming volume [Handbook Of Economic Growth](#) includes a contribution by Harvard's Francesco Caselli titled: [The Missing Input: Accounting for Cross-Country Income Differences](#) It assumes national output (Y) relates to capital stock (K), labor (L) and productivity (A) via a traditional modified Cobb-Douglas production function, viz.:

$$y = (Y/L) = A \times (K/L)^{\alpha} \times h^{1-\alpha}$$

assuming a capital share, α , of 1/3, and the modifier of an (average) education-only-determined human capital multiplier (h) for labor, (obtained empirically from wages), as shown in the graphic below:



([Easterly & Levine](#) suggest the ratio of skilled to unskilled wage is about 2 in the US and within India, the wage of engineers is only about 3 times the wage of building laborers.) The effect on relative GDP from mean schooling level, per the model graphed above is shown in the graphic immediately below:



(Note that *by hypothesis* within this model, 12 added years of education can do little more than *double* national income, unlike the *58-fold* improvement we saw in our linear *regression* of logarithmic income and schooling.)

If the model were valid and "(Total Factor) Productivity" or TFP (misleadingly often called "technology") were the same in all nations, the capital stock and workforce size and quality would predict national income. Roughly speaking, the author finds that the multiplicative error of the prediction spans a range of about 3 to 1 for an extremely large collection of countries from very rich to very poor. This argues that *how* you make use of what you have is critical - even if, in theory at least - much scientific, technical and business knowledge is not a secret.

Note that this TFP variation is more important than how education can effect GDP within the assumed model, in which all educational benefits are restricted to better human capital multipliers.

Maybe lots of education is critical for "[innovation](#)", rather than "production". So perhaps the best intuitive argument for more education might be the hope that it could (implicitly) improve TFP. Whether or not you believe such improvement would stem disproportionately from an elite, would lead you to concentrate advanced education on that elite, or more broadly throughout the workforce. But [Jorgenson \(2004\)](#) takes a 'contrarian' view that

...investment in tangible assets is the most important source of growth in the G7 nations... The relative importance of productivity growth is far less than suggested by the traditional methodology of Kuznets (1971) and Solow (1970), which is now obsolete.

Note also that in recent years, a lot of skepticism has been expressed about the very validity of the Cobb-Douglas formulation - even by Nobel laureate Robert Solow, whose reputation was made by his now-canonical 1956 neo-classical [growth calculation](#) using that framework to derive [Kaldor's "stylized facts"](#). (Find a recent (2000) quantitative examination of the Kaldor synopsis [here](#).)

An engineer taking a microeconomic view of industrial output would be inclined to say that the trade-off between labor and capital reflects the competition between alternative industrial processes, each of which follows a [Leontif](#) production function, with switches between them suffering opportunity costs. (The Leontif production function might be the basis for supposing the correctness of the older [Harrod-Domar model](#), which postulates, a priori, Kaldor's observation of a steady capital-output ratio.)

Economist Douglas and mathematician Cobb were inspired to develop their eponymous production function based on empirical studies of industrial manufacturing an entire century ago. Can this formulation also apply to a world where medicine, education, entertainment and other services are giant parts of the overall economy?

Cobb-Douglas is an extremely simple-minded parameterization of a complex economy: All types of capital are the same; all types of labor are the same. That the aggregate output of an industry - much less the entire national economy - should follow a simple Cobb-Douglas form might well be met with surprise. Even with the addition of the education modifier, such as used by Caselli above, one assumes that only the average number of years of schooling matter - not its distribution among workers. The "apples are oranges" approach to capital was in fact the basis of an important debate, the so-called "[Cambridge capital controversy](#)".

Empirically, it is well known that within particular sectors of the economy, the labor share of income, $1-\alpha$, is rather different than for the economy as a whole. [Gollin \(2001\)](#) observes:

In the United States, the employee compensation shares of value added in agriculture and mining are, respectively, only 0.212 and 0.361, while the employee compensation share in manufacturing is 0.732 and the share in "community, social, and personal services" is 0.751.

(Admittedly, the α variation problem is not that bad in typical modern economies, since the latter employee compensation share values are very common and the former very rare.)

But still it is remarkable that so many economists should hang onto the Cobb-Douglas formulation to this very day. No small part of its appeal is its simplicity. But as Einstein supposedly once said, restating Occam,

Things should be made as simple as possible... but no simpler!

Our concerns about the naivete of Cobb-Douglas and variants notwithstanding, a 2003 Brookings study, [The Empirics of Growth: An Update](#) looked at cross-country development using the same sort of "growth accounting" model. Minor differences from Caselli are assumption of a capital share of 0.35 and a constant 7% per-year-education improvement to the human capital multiplier.

The report found (cf. table below) that increased duration of formal education played a very minor role in explaining the growth in the "industrial" (rich) countries over the period 1960-2000, compared to increases in capital and TFP. The same was true in a poor country, China. In general, increased duration of formal education proved significant only in regions where overall growth was stagnant or poor nonetheless.

from Table 1. Sources of [Average Annual Percentage] Growth, Regions, 1960-2000

Region (lands)	Output	Output per Worker =	Physical Capital +	Education +	Factor Productivity
World (84)	4.0	2.3	1.0	0.3	0.9
Indust. (22)	3.5	2.2	0.9	0.3	1.0
China (1)	6.8	4.8	1.7	0.4	2.6
E.Asia w/o China (7)	6.7	3.9	2.3	0.5	1.0
Latin Am. (22)	4.0	1.1	0.6	0.4	0.2
South Asia (4)	4.6	2.3	1.0	0.3	1.0
Africa (19)	3.2	0.6	0.5	0.3	-0.1

Middle East (9)	4.6	2.1	1.1	0.4	0.5
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The study cautions:

There is a long-standing debate over how to interpret the coefficient on years of schooling in the microeconomic analyses of wage differentials. Does it reflect the skill gains from education? ...Or does the educational process simply sort people by native abilities, thereby providing a convenient indicator.. of hard-to-observe characteristics? If the latter process dominates, aggregate gains would be limited... and would be substantially overstated by estimates of the private return.

Summarizing previous work, it reports:

At the macroeconomic level, a number of recent studies have been unable to find a correlation between economic growth and increased educational attainment. This result has been used as a basis for rejecting the microeconomic evidence and for arguing that the focus of governments and the multilateral organizations on raising levels of literacy and average educational attainment has been misplaced... [But] given that average years of schooling change very slowly, the effects on output growth may be hard to detect in the international data... Early studies... found a significant positive association between cross-national differences in the initial endowment level of education and subsequent rates of growth... However, efforts to use natural experiments, such as episodes of change in compulsory education requirements or other changes in schooling that are uncorrelated with ability, have found little evidence of a significant upward bias in the estimated return.

Processing its own data, it concludes:

Macroeconomic evidence of the contribution of education to growth is clearly much weaker than that derived from microeconomic studies.

One is reminded of an [essay](#) on education in *Forbes* by the gadfly Peter Brimelow a decade ago, which contains such memorable words as these:

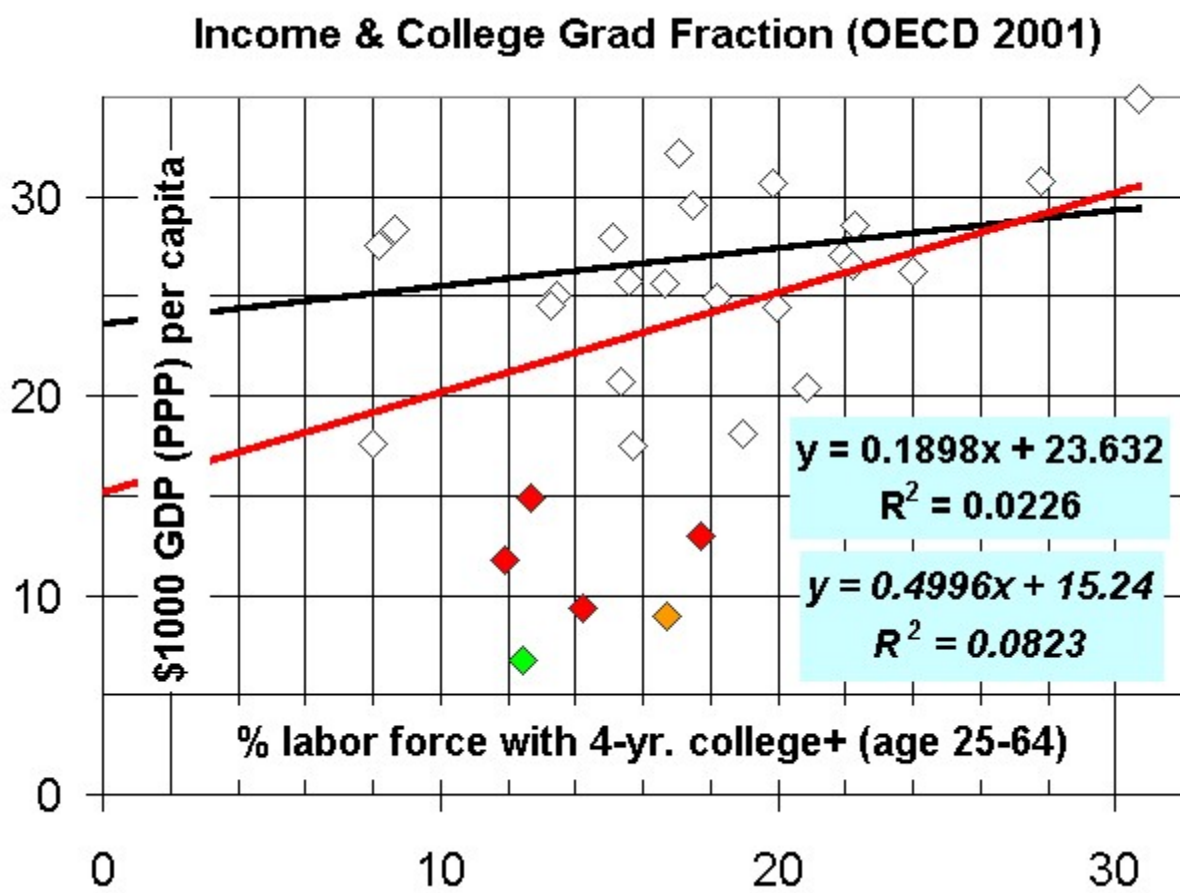
According to Engel's law... the proportion spent on necessities falls as wealth increases, and the share devoted to luxuries rises. Education, by this criterion, is acting not like a necessity but like a luxury. At least in part it seems to function not as an investment good but as a consumption good. Which means that spending on education is no more sacrosanct than spending on, say, whiskey.

Were the creators - or at least the appliers and popularizers - of the technological breakthroughs which underlie the Industrial Revolution and the subsequent multipliers of productivity paid their marginal productivity contributions? (Rather than treating all "PhDs" and "MBAs" as "salarymen".) Perhaps one day an economic model which embraces this critical aspect of the economy to endogenize productivity gains would do a better job of explaining economic output. If education (or for that matter, research) is critical to such breakthroughs, perhaps a more rational justification for their support could be made.

Does mass college education work in the developed world?

Does multiplying the size of the educated elite increase total factor productivity within a nation, by expanding the pool of better leaders? The massive growth of tertiary education in the OECD (wealthiest) countries has helped to raise the average number of years of schooling they exhibit. But we know that higher average years of schooling between such nations is not strongly related to higher average incomes. What if we looked at the direct influence on average income between such nations of more four-year college degrees?

Using OECD provided data, as summarized [here](#), we can examine this question. (Aside: this data set contrasts somewhat with the data set used in our first graph above from [International Data on Educational Attainment: Updates and Implications](#), Robert J. Barro and Jong-Wha Lee, CID Working Paper No. 42, April 2000, as the latter note and comment upon.)



The statistical importance of having a larger fraction of the workforce with college degrees is *very* tenuous (single-digit-percentage variance reduction) in the OECD nations, albeit there exists a positive correlation. If all 30 nations are included, the linear regression trend line shows about a \$50,000 rise in PPP GDP per capita going from no to all college grads. But if one leaves out the six countries which are either developing or ex-Communist nations (colored markers in the chart immediately above) the rise is only about \$19,000. (The chart shows the details of both linear fits.)

The meaningful point is that a country can be among the wealthiest nations without many college grads in the workforce: Austria and Denmark do about as well as Canada, Australia and Japan with only 3/8 as many college grads per capita in the workforce. (Aside: The 8-9% college grad rate seen in Austria and Denmark recalls the 6% minimum noted above for IALS achievement levels 4 and 5.)

Given the *monumental* residual variance in income after accounting for the fraction of the workforce with college degrees, we *cannot reject* the hypothesis that increasing the fraction of college grads in the workforce fails to raise the average wage! Were that hypothesis true, the fact that there are substantial wage premiums associated with more schooling in all of these countries would lead one to infer that having a larger fraction of college grads in the workforce only serves to increase wage inequality, without social returns of any kind, and argues against public subsidy of such schooling.

[The World Factbook](#) the US CIA publishes writes this:

The onrush of technology largely explains the gradual development of a "two-tier labor market" in which those at the bottom lack the education and the professional/technical skills of those at the top and, more and more, fail to get comparable pay raises, health insurance coverage, and other benefits. Since 1975, practically all the gains in household income have gone to the top 20% of households.

In closing, I will let you consider some [irreverent ideas](#) about college education - and particularly doctoral programs - by physicist [Freeman Dyson](#). And to complement this, you can also weigh the dim appraisal psychologist and computer scientist [Roger Schank](#) has of [traditional schooling](#) in general.

Alternatives to more school: the developing world

In wealthy countries, resources mistakenly diverted to excessive amounts of education may do no grave harm, even if they do not deliver the social economic returns which people imagine. But what about poor countries? Money spent on more education might instead be spent on other critically important things - like improved water supplies, public health, roads or resources for fighting corruption and injustice. When choices are a matter of life and death, making mistakes is very expensive, even if there are no obvious methods of determining the best course of action.

The spread of mass media (especially visual evidence like film and video) to give knowledge of far-away lands, even in rather poor countries, is a remarkable development in itself. Traditional societies everywhere (including the historic pre-industrial West) typically have embraced resignation to forbearance of a world that *cannot* be substantially improved. Why dare dangerous or just costly experiments to make things better if it is futile? The example of many people far away who in fact do much better is a powerful incentive to dream of a superior future close to home - and dare to reach for it. Sadly, it can also give flight to envy, suspicion and hatred of others, too. Happily, the example of societies which have gone from being very poor to being quite comfortable well within a single human lifetime mitigates such negativity. We don't know the full impact this powerful psychological agent has - or will have - on development, but we know it is a relatively new historical factor born of 20th century advances.

In [The Mystery of Capital...](#), Hernando De Soto argues that what the developing world needs is a means of legitimating and titling real property, so that it can be collateralized for investment goods. This is a legal and political change, not a material input. But are there powerful players who would not want to see such a change take place? Perhaps money spent on more education might better be spent paying them off, to gain their veto-potent consent.

But isn't knowledge powerful? Can't it help people discover the truth and help them make better decisions? Even if this is so, it is not obvious that all types of information delivery optimally provide either the needed knowledge, or improved skill at acquiring it. That's why wireless telephones for small business people and governing officials might be more effective an investment than more textbooks (or laptop computers!) for children.

If the technological revolution has profound implications for education in developing countries, where the amount of schooling is limited, perhaps it is in ultimately providing a *superior means for storing and communicating information than with printed paper*. A text library is far more cheaply stored electronically than on paper - so cheaply that it does not make sense to "return" (erase) a borrowed electronic book of text, save to deny access to the borrower for the sake of making it rare and hence valuable! (In a world where anyone can cheaply copy and store information, intellectual property compensation is hard pressed to use an auditing model based on measuring the number of copies an author dispenses.)

Simple visual text began as digitized speech. If audible speech itself can be stored more cheaply than written text once was - either through conventional audio compression or "textification" and later speech synthesis, then perhaps much of the point of teaching a person to turn written text into (perhaps unvoiced) speech may vanish. Since this takes up not a little amount of primary education, eliminating the need to acquire this skill frees time and resources for other things.

Of course broadcast radio and television have long provided an education of sorts for the preliterate and illiterate. But cheap *storage* of audio and pictures lets the consumer *time-shift* them from their genesis to an occasion convenient to his needs and stage of personal development - and even to purposes inconsistent with those who control the broadcast towers - not to mention the markets, schools, churches or other institutions. Indexing such content - so that it can be searched electronically - is even more empowering.

And what about IQ? The so-called [Flynn Effect](#) is the startling discovery that remarkably poor *basic* actuarial competence long hid the apparent long-term rise of mean *absolute* IQ in the developed countries, where testing of this type has a long history. (The fallout for the previously observed intergenerational IQ heritability is then that the child tends to inherit his parents' *percentile standing* within the spread of advancing societal IQs.)

We *still* don't understand the origins of this development. (The differential fertility among different IQ tiers in the population would tend to *decrease* IQ inter-generationally!) But if a higher society IQ is as useful in developing countries as it is *supposed* to be in developed ones, perhaps efforts to promote it (better diet, [extensive interactive media exposure](#), or whatever might be its potential mysterious promoting agent(s)) would prove more efficacious than simply increasing the number of years spent in formal education.

One intriguing possibility (with no evidence of which I know) is the following - could natural selection have made IQ environmentally adaptive, so that an individual might develop an IQ within a non-trivial range to maximize his adaptation to the environment in which he spends his childhood? (Sexual selection is an example of "computational acceleration" which "short-circuits" protracted natural selection re-testing, by recycling old, possibly obsolete, data.) We know that children typically manifest human language plasticity which they lose later on - their brains are sculpted to achieve superior auditory competence in the language environment in which they happen to find themselves!

If your environment is stubbornly stable, it's not clear that being smart enough so you can spend time figuring how things work to improve them is adaptive. It might just be better to spend as much time as possible executing traditional patterns of survival and find gratification in boring stability. If you do best by doing an old-fashioned "mind numbing" factory or clerical job, then maybe it is best to have a "numb mind" that will enjoy it!

The Internet and telerobotics have the potential to radically reduce the barrier which geography imposes on the export/import of services (as opposed to goods like commodities and merchandise), with important implication for people in developing countries who are skilled to provide services needs in developed ones. In the 2002 book, [*Flesh and Machines: How Robots Will Change Us*](#), Prof. Rodney Brooks, MIT's AI Lab director, wrote the following:

Here now is the killer app for robots in the short term. Physical work can be done from any place in the world. The implications of this will be profound on the world's economy.

He fleshes this out by looking at rapidly aging Japan, opposed to immigration, which will turn to workers in other countries to telework in such fields as agriculture, construction and nursing.

Of course high-skill "hands-on" services can cross the planet without immigration in an age of affordable travel and effective global marketing: for example, "medical tourism," in which someone in the developed world goes to a developing world nation for an expensive surgery, receiving world-class care at prices deflated by the action of PPP corrections to currency exchange rates, if nothing else.

In years gone by, developed nations like the United States could in effect "export" services by educating developing world university students in the US. With the advent of lifelike telepresence, many of these students can remain in their home countries - even lacking local institutions to serve them. Their tuition would still flow to the US, but their living expenditures would be made in their home countries. (Xenophobic hysterics in the US today can only help speed this process.)

In these ways, technology has the potential to connect people in developing countries to the global economy in new ways which can profoundly disrupt their traditional trade with developed countries. The opportunities for unusually talented people are especially improved. In his 2005 book [*The World Is Flat...*](#) author Thomas Friedman says that Microsoft co-founder Bill Gates told him that

Thirty years ago... if you had a choice between being born a genius on the outskirts of Bombay [Mumbai] or Shanghai or being born an average person in Poughkeepsie, [New York] you would take Poughkeepsie, because your chances of thriving and living a decent life there, even with average talent, were much greater... Now... [one] would rather be a genius born in China than an average guy born in Poughkeepsie.

Not by bread alone?

More broadly, one can question whether GDP maximization should receive the attention it does - at least for the very wealthy nations. For example, is it inherently bad if something moves from the market sector into the domestic sector? As the old (pre-Feminist?) saw went, "If a man marries his housekeeper, the GDP goes down". More pointedly, not everything that raises GDP reflects an obvious improvement in life. Are high expenditures for soldiers, lawyers and physicians always welcome additions to the GDP? Such considerations encourage one economist to [define](#) the following term:

Bads: The opposite of 'goods'. Elements produced by an economy that diminish consumers' welfare, and would constitute a subtraction from GDP in some better, future system of social accounts to measure economic welfare. Bads include congestion (waiting in traffic jams), pollution, increases in crime (which increase measured GDP to the extent that they trigger greater expenditures on security), and the depletion of valuable resources (which are thus removed from the wealth of future generations).

One possible alternative "system of social accounts" is offered by the [*Genuine Progress Indicator*](#).